

**We claim:**

1. A method of immobilizing membrane-associated molecules in silica matrixes comprising combining a liposome- assembly comprising the membrane-associated molecule with a protein- and membrane-compatible sol-gel precursor under conditions which allow a gel to form.
2. The method according to claim 1, wherein the protein- and membrane-compatible sol-gel precursor is selected from an organic polyol silane and sodium silicate.
3. The method according to claim 2, wherein the organic-polyol silane precursor is derived from sugar alcohols, sugar acids, saccharides, oligosaccharides and polysaccharides.
4. The method according to claim 3, wherein the organic-polyol silane precursor is derived from glycerol, sorbitol, maltose and dextran.
5. The method according to claim 4, wherein the organic-polyol silane precursor is selected from the group consisting of diglycerylsilane (DGS), monosorbitylsilane (MSS), monomaltosylsilane (MMS), dimaltosylsilane (DMS) and a dextran-based silane (DS).
6. The method according to claim 5, wherein the organic-polyol silane precursor is diglycerylsilane (DGS).
7. The method according to claim 1, wherein the membrane-associated molecule is selected from the group consisting of non-natural ionophores, ion channel proteins, ion-channel receptors, G-protein coupled receptors, membrane transport proteins or membrane associated enzymes.

8. The method according to claim 6, wherein the membrane-associated molecule is selected from the group consisting of gramicidin, bacteriorhodopsin, the acetylcholine receptor and ionomycin.
9. The method according to claim 1, wherein the liposome comprises phospholipids.
10. The method according to claim 9, wherein the lipid comprises 1,2-dioleoyl-*sn*-glycero-3-phosphocholine (DOPC).
11. The method according to claim 1, comprising the steps of :
  - (i) combining an aqueous solution of the protein and membrane-compatible, sol gel precursor with an aqueous solution of a liposome assembly comprising the membrane-associated molecule;
  - (ii) adjusting the pH of the combination of (i) so that it is in the range of about 4-11;
  - (iii) shaping the combination into a desired shape;
  - (iv) allowing the combination to gel; and
  - (v) aging and partially drying the gel.
12. The method according to claim 11, wherein the gel is dried in an aqueous buffer, optionally comprising an effective amount of a humectant.
13. The method according to claim 11, wherein the aqueous buffer comprises about 5% to about 50%% (v/v) of glycerol.
14. The method according to claim 1, wherein the liposome- assembly comprising the membrane-associated molecule and the protein and membrane-compatible, sol-gel precursor are combined in the presence of an indicator molecule and/or in the presence of one or more ligands for the membrane-associated molecule.

15. A protein- and membrane-compatible sol-gel with a liposome-assembly immobilized therein prepared using the method according to claim 1.

16. A method for the detection of modulators of a membrane-associated molecule comprising:

- (a) exposing the protein- and membrane-compatible sol-gel according to claim 15, to one or more test substances; and
- (b) detecting a change in one or more characteristics of the membrane-associated molecule,

wherein a change in the one or more characteristics of the membrane-associated molecule in the presence of the one or more test substances compared to a control indicates that the one or more test substances are modulators of the membrane-associated molecule.

17. The method according to claim 16, wherein the membrane-associated molecule is an ion channel molecule and the characteristic that is detected is ion flux through the molecule.

18. An improved method for the detection of membrane potentials in a sol-gel entrapped liposome assembly comprising a membrane associated molecule, wherein the membrane-associated molecule is an ion-channel molecule, comprising:

- (a) obtaining a solution of the liposome assembly having an indicator molecule located on the interior of the assembly;
- (b) removing the indicator molecule from solution external to the liposome assembly;
- (c) combining the liposome assembly solution with a silica precursor solution under conditions which allow a gel to form;
- (d) contacting the gel with the ion and optionally a test substance; and
- (e) detecting a change in the indicator molecule upon transmembrane flux.

19. The method according to claim 18, wherein the indicator molecule interacts with the surface of the sol-gel.

20. The method according to claim 19, wherein the indicator molecule is safranin O.
21. The method according to claim 18 where the indicator molecule acts by detecting the ion directly upon entry into the interior of an entrapped liposome.
22. The method according to claim 21 wherein the indicator molecule is a Ca(II) dependent fluorophore.
23. The method according to claim 22 wherein the indicator molecule is fluo-3.
24. The method according to claim 21 where the response of fluo-3 is modulated by agonist or antagonist binding to a LCIG embedded in the lipid membrane.
25. The method according to claim 24 where the LCIG is nAChR.
26. A kit, biosensor, microarray, chromatographic or bioaffinity column comprising the protein- and membrane-compatible sol-gel with a liposome-assembly immobilized therein according to claim 15.
27. A method of conducting a target discovery business comprising:
  - (a) providing one or more assay systems for identifying test substances by their ability to modulate one or more membrane-associated molecules based systems, said assay systems using a method according to claim 16;
  - (b) (optionally) conducting therapeutic profiling of the test substances identified in step (a) for efficacy and toxicity in animals; and

- (c) licensing, to a third party, the rights for further drug development and/or sales or test substances identified in step (a), or analogs thereof.